Stereotactic Body Radiotherapy for Recurrent or Oligometastatic Uterine Cervix Cancer: A Cooperative Study of the Korean Radiation Oncology Group (KROG 14-11)

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Abstract. *Aim: To evaluate local control and patient survival for recurrent or oligometastatic uterine cervical cancer treated with stereotactic body radiotherapy (SBRT) using CyberKnife, and to demonstrate the safety of SBRT. Patients and Methods: Between 2002 and 2013, 100 recurrent or oligometastatic lesions in 85 patients were treated with SBRT at three Institutions. SBRT sites were within the previous RT field in 59 and partially overlapped in nine. SBRT sites included three local recurrences, 89 lymph node metastases, and eight distant metastases. Patients were treated with a median dose of 39 Gy in three fractions, which was equivalent to a biologically effective dose (BED) of 90 Gy. Results: The median follow-up period was 20.4 months. Local failure occurred in 17 out of 100 SBRT-treated sites. The 2-year and 5-year local progression-free survival rates were 82.5% and 78.8%, respectively. Eleven local failures occurred within the previous RT field. The 2-year and 5-year overall survival rates were 57.5% and 32.9%, respectively. BED >90 Gy (p=0.072) and >69 Gy (p=0.059) and longer disease-free interval (p=0.065) predicted marginally superior local control. Re-irradiation appeared to be related to inferior local control (p<0.001), but the SBRT BED in this group was much lower than the dose in the other group (median BED, 79 Gy vs. 90 Gy). Chronic toxicities of grade 3 or more occurred in five cases. Conclusion: SBRT for recurrent or oligometastatic cervical cancer resulted in excellent local control, especially with a long disease-free interval and high BED treatment, with acceptable toxicities. Therefore, SBRT can be considered a therapeutic option for these patients.*

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Key Words: Cervical cancer, recurrent, oligometastasis, stereotactic body radiotherapy, CyberKnife, radiosurgery.

Carcinoma of the cervix is the second most common malignancy in women worldwide (1). Although a high number of patients with cervical cancer are detected with disease of curable status, patients with advanced disease not amenable to curative treatment or those with recurrent disease have a poor prognosis (2-5).

Although chemotherapy remains the major treatment modality for recurrent and metastatic cervical cancer, the response rates are still low while toxicities are severe. Patients with a central pelvic gynecological recurrence have a chance of cure, with exenteration providing pelvic control in approximately one-third at the expense of risks of severe complication (3). However, for a non-central recurrence, cisplatin is the most active single agent, with overall response rates between 20% and 30%; however, combination regimens with platinum have not demonstrated meaningful survival benefit (2, 5). Moreover, response to second-line therapy is low and of unproven benefit. Novel therapeutic strategies are required for these patients to improve the results and life quality.

Stereotactic body radiotherapy (SBRT) is an emerging radiation technique used to provide high doses to tumors and improve targeting. SBRT in a few fractions allows for delivery of high doses of radiation to the tumor with a steep dose gradient outside the targets, thus sparing normal critical

organs and providing an opportunity for dose escalation. This is particularly important for the treatment of recurrent and metastatic disease, especially in patients with a history of irradiation. Recently, several studies showed that SBRT using modern techniques are safe and effective for the treatment of recurrent gynecological cancer (6-8).

For patients who have limited recurrent and metastatic cervical cancer and are in good general condition, the goal of therapy should not only be to palliate pain, but also to administer ablative doses of radiation to improve local control and to expect possible overall survival gain, maintaining a good quality of life. In this context, we hypothesized that SBRT for recurrent or metastatic cervical cancer limited to fewer than three regions, after complete remission or stable status had been achieved with initial radical treatment, can achieve a good local control and may improve survival.

The purpose of the present study was to assess the efficacy and toxicity of SBRT for recurrent or metastatic cancer of the uterine cervix with SBRT using CyberKnife.

Patients and Materials

Patient selection. Between September 2002 and May 2013, 100 recurrent or metastatic uterine cervical cancer lesions in 85 patients treated with SBRT at three Institutions in Korea were evaluated. Inclusion criteria were as follows: i) histologically-proven primary uterine cervical cancer, ii) complete response or stable disease after initial treatment for primary cancer, iii) all measurable locoregional recurrence or metastases of body, and iv) oligometastases in three or fewer sites if individual sites were curatively treated with surgery or radiotherapy. Re-irradiation at the SBRT site was included. Exclusion criteria were as follows: i) previous history of malignancies, ii) central nervous system metastases, iii) SBRT as boost treatment, and iv) no follow-up images. This study was approved by the Institutional Review Board of each institution participating in this trial and Korean Radiation Oncology Group (KROG 14-11). After the approval, we retrospectively reviewed the medical and radiotherapy records of eligible patients.

Treatment. All three participating Institutions are equipped with CyberKnife robotic stereotactic radiosurgery system (Accuray, Sunnyvale, CA, USA). According to tumor location and preference of each institution, 2-6 gold fiducials were placed near the tumor percutaneously under fluoroscopy or under computed tomographic (CT)/ultrasound guidance.

Treatment planning began with immobilization using customized cradle in the supine position about 1 week after fiducial placement. CT-based simulation was performed with intravenous contrast with a 1.5~2mm slice thickness. Magnetic resonance imaging (MRI) for image fusion was performed, if necessary, on the same day with planning CT to identify the exact location of tumors and to aid organ-at-risk delineation. PET(positron emission tomography)-CT was often used as a reference for tumor delineation. Treatment was planned by MultiPlan (Accuray).

The gross tumor volume (GTV) was contoured on planning CT/MRI. All other organs at risk (e.g. lung, esophagus, aorta, and bowel) were delineated depending on the target lesion location without margins. Generally no margin was added to the GTV for the clinical tumor volume (CTV), but the regional lymphatic area around metastatic lymph nodes (LNs) was included in the CTV in some cases. The planning target volume (PTV) was defined as GTV or CTV, if it existed, plus 3 mm. The PTV was modified only if it was it possible to maintain the radiation dose-constraint for surrounding critical organs such as bowel or spinal cord. Radiation doses were prescribed at 76-83% of the maximum dose isodose line (median, 80%) to cover at least 93% of the PTV. Dose and fractionation was determined by tumor location, treatment volume, and history of prior radiotherapy. The SBRT dose was converted to the biologically effective dose (BED) to compare different dose-fractionation schedules. The BED was calculated using the linear-quadratic model with $\alpha/\beta=10$ Gy for the tumor. All treatment plans were retrospectively reviewed and dose–volume histogram data were collected.

Response and toxicity evaluation. Patients were followed-up at 1 month for the first year, every 3 months for 2 years, and every 6 months for 3 additional years thereafter. Clinical history taking, physical examination, follow-up imaging, and serum tumor markers were checked every visit. Treatment response was assessed by CT/PET-CT scans per RECIST(Response Evaluation Criteria in Solid Tumors) criteria version 1.1 (9). Local progression was primarily defined as progressive disease by imaging, or when other therapy was required, such as surgery or re-irradiation after SBRT as salvage treatment.

Acute toxicity during treatment and within the first 6 weeks, and chronic toxicity lasting more than 6 weeks after treatment was evaluated according to CTCAE(Common Terminology Criteria for Adverse Events) version 4 (10).

Statistical analysis. Statistical analysis was performed using the SPSS software (release version18; SPSS Inc. Chicago, IL, USA). Overall survival (OS) was calculated from the first day of SBRT to the day of death of the patient. Disease progression-free survival (DPFS) was separately calculated from the first day of SBRT to the day of death per each treatment site because some patients had several sessions of SBRT at different sites and at different times. Actuarial local progression-free survival (LPFS), DPFS, and OS rates were calculated according to the Kaplan–Meier method, and comparisons between groups were performed using log-rank tests. A *p*-value smaller than 0.05 was regarded statistically significant.

Results

Patients, tumors, and treatment. A total of 100 lesions in 85 patients were treated with SBRT for recurrent or metastatic uterine cervical cancer. Nine out of 85 patients had multiple SBRT sessions. One patient was treated with total of four SBRT sessions to different metastatic lesions; two metastatic lesions (left supraclavicular LN and para-aortic LN) were treated with SBRT consecutively, and all showed near complete response, iliac bone metastasis at 6 months later and para-aortic LN metastasis at 1 year from first SBRT were detected and were also treated with SBRT. Four patients had three, and another four patients also had three SBRT sessions simultaneously or at time intervals, according to disease progression.

Patient and tumor characteristics at primary cervical cancer diagnosis are summarized in Table I. The median age at primary cancer diagnosis was 46 years. Initial stages and their definitive treatment are also shown in Table I. The median age at each diagnosis of recurrent or metastatic cancer was 48 years, and the median follow-up duration was 20.4 months. SBRT sites were within the previous RT field in 59 cases, and partially overlapped with previous RT field in nine cases. For SBRT sites, three were local recurrence at the cervix or parametrium, 89 were LN metastases, and eight were metastasis to other organs, respectively. Among LN metastases, para-aortic LNs (including preaortic, aortocaval and retrocrual; n=52) were the most common, and pelvic LNs (n=31) the second most common site treated.

SBRT was performed mostly in three fractions. SBRT was delivered in 5 or 10 fractions in four cases only mainly due to bowel proximity in re-irradiation. The most common SBRT dose-fractionation schedule was 39 Gy in three fractions (44 patients), which was almost 90 Gy in BED. Nineteen and 33 patients were treated with 41-51 Gy and 27-38 Gy in three fractions, respectively. The remaining four patients were treated with 30-45 Gy in 5-10 fractions because of bowel proximity among re-irradiation cases.

Table I. *Patient and tumor characteristics at primary cervix cancer diagnosis.*

N=85 patients		Number (%)
Age at diagnosis	<50 Years	58 (68.2)
(median=46, range=29-78)	≥50 Years	27 (31.8)
Initial FIGO stage	0 (CIN)	2 (2.4)
	IA	2 (2.4)
	IB	28 (32.9)
	IIA	10 (11.8)
	IIB	30 (35.3)
	IIIA	2 (2.4)
	IIIB	5 (5.9)
	IVA	3 (3.5)
	IVB	1 (1.2)
	Unknown	2 (2.4)
Initial treatment	Surgery	14 (16.5)
	RT*	8 (9.4)
	CCRT	26 (30.6)
	Surgery+RT*	15 (17.6)
	Surgery+CCRT*	22 (25.9)

CIN, Cervical intraepithelial neoplasia; RT, radiotherapy; CCRT, concurrent chemoradiotherapy. *Whole-pelvis radiotherapy, with/without intracavitary radiotherapy.

Clinical outcomes. The median follow-up period was 20.4 (range=2.1-128.2) months. Disease progressed in a total of 57 among 100 studied tumors. Seventeen progressed at SBRT sites, with or without other site progressions, which was treatment failure by definition of our protocol. Nine local progressions occurred only at SBRT sites, but eight were accompanied by disease progression at other sites. Forty were progression at sites other than SBRT.

The actuarial 2-year and 5-year LPFS rates were 82.5% and 78.8%, respectively. Details of local progression are provided in Table II. The median time to local progression was 6.2 (range=1.4-26.7) months. Seven treatment sites showed disease progression despite SBRT of more than 39 Gy in three fractions (BED, 89.7 Gy). Notably, disease at one treatment site progressed even after 45 Gy in three fractions (BED, 112.5 Gy). Eleven treatment sites which showed local progression occurred within the previous RT field. One treatment site was partially included in a previous RT field.

The median DPFS was 14.3 months and the actuarial 2-year and 5-year DPFS rates were 42.4% and 34.4%, respectively.

Fifty out of 85 patients had died at the time of analysis, and all deaths were attributed to disease progression. The median OS time was 32.7 months. The actuarial 2-year and 5-year OS rates were 57.5% and 32.9%, respectively. Fourteen out of 85 patients (16.5%) lived for more than 5 years after completion of the first session of SBRT.

Prognostic factors predicting local treatment failure. Table III shows the results of univariate analyses of variables predicting local progression at the SBRT site, which was treatment failure. When analyzed according to SBRT dose, a BED of more than 89.7 Gy (≥39 Gy in three fractions, $p=0.072$) and 69.3 Gy (≥33 Gy in three fractions, $p=0.059$) predicted marginally-superior local control (Figure 1). A disease-free interval longer than 36 months was also related to marginally superior local control ($p=0.065$). Solitary recurrence was not associated with superior local control. Re-irradiation did appear to be related to inferior local control ($p<0.001$), but the SBRT dose for the re-irradiation group was far less than the dose for the other group (median BED, 79.2 Gy *vs*. 89.7 Gy).

We did the sub-group analysis on local control of para-aortic LNs (n=52) and pelvic LNs (n=31), which were the most and the second most common SBRT site in our study. Local control of para-aortic LNs was significantly superior compared to that of pelvic LN ($p=0.025$). The 2-year LPFS were 87.5% in those with para-aortic LN metastases and 66.3% in those with pelvic LN metastases, respectively (Figure 2). Eight out of 52 lesions in para-aortic LNs (15.4%) and 20 out of 31 pelvic LN lesions (64.5%) were re-irradiated, respectively.

Prognostic factors predicting the OS rate. OS was calculated from the first day of the first SBRT session in cases of multiple sessions for one patient. Neither SBRT dose nor the

Table II. *Details of 17 local treatment failures.*

Case no.	SBRT site	RT field overlap	Time to SBRT (months)	Other metastases	Dose (Gy)	BED (Gy)	Time to local progression (months)
1	PAN-Rt CIN	O	25.5	X	33	69.3	3.1
2	PAN	O	26.5	O	36	79.2	10.7
3	PANs	X	34.0	O	36	79.2	16.6
4	Rt PAN-CIN	O, Partially	15.2	O	39	89.7	1.4
5	Lt PAN	O	37.8	X	30	60.0	2.7
6	Lt PAN	X	46.4	X	39	89.7	14.3
7	Lt PAN	O	61.3	X	39	89.7	1.4
8	Lt PAN	X	12.9	X	39	89.7	26.1
9	Lt PAN-CIN-EIN	O	14.5	O	33	69.3	7.5
10	Mediastinal LN (4R-10R)	X	34.8	X	36	79.2	26.7
11	Lt CIN	O	34.1	X	45	112.5	6.2
12	Lt EIN	O	23.5	X	30	60.0	5.8
13	Lt EIN	X	30.2	X	36	79.2	4.3
14	Rt IIN	O	33.5	O	38	85.0	8.0
15	Rt CIN	O	8.5	X	39	89.7	16.3
16	Lt CIN	O	8.5	X	39	89.7	3.0
17	Rt IIN	O	21.4	X	36	79.2	1.9

SBRT, Stereotactic body radiotherapy; RT, radiotherapy; BED, biologically effective dose; LN, lymph node; PAN, para-aortic lymph node; CIN, common iliac lymph node; EIN, external iliac lymph node; IIN, internal iliac lymph node; Lt, left; Rt, right; X, no; O, yes.

presence of more than one recurrence was associated with OS. SBRT as re-irradiation was associated with inferior OS (p=0.023). A short disease-free interval (<36 months) was also marginally associated with inferior OS (p=0.092).

Toxicity. Treatment was generally well-tolerated from initiation and within the first 6 weeks, and only grade 1-2 acute toxicities were observed.

Regarding chronic toxicity after 6 weeks from SBRT, grade 4, grade 3, and grade 2 toxicities occurred in two, three, and nine cases, respectively. Details of grade 4 and grade 3 toxicities are provided in Table IV. Two grade 4 toxicities were recto-vaginal fistulas developed at 5.7 and 6.3 months after SBRT, and they were treated with surgical intervention. Both patients had been treated with radical surgery and adjuvant whole pelvis RT as primary therapy for cervical cancer, and had SBRT of recurrence in the right internal iliac LN; one patient showed local tumor progression 2 months later, and the other did not. Three grade 3 toxicities were urethral stricture, ileus, and enterocolitis.

Table III. *Univariate analysis for local progression-free survival (LPFS).*

Variable	No. of treatment sites (n=100)	LPFS rate at 2 years (%)	p-Value
SBRT dose (BED 89.7 Gy)			0.072
≥39 Gy in 3 fractions	62	88.5	
<39 Gy in 3 fractions	38	73.5	
SBRT dose (BED 69.3 Gy)			0.059
≥33 Gy in 3 fractions	68	87.7	
<33 Gy in 3 fractions	32	66.1	
Re-irradiation			<0.0001
Yes	32	60.2	
No	68	92.8	
Solitary recurrence			0.975
Yes	29	79.9	
No	71	83.8	
Time to recurrence			0.065
≥36 months	35	90.8	
<36 months	65	77.3	

SBRT, Stereotactic body radiotherapy; BED, biologically effective dose.

Discussion

The treatment of recurrent cervical cancer is challenging, even for disease recurring locoregionally within the pelvis. To choose the therapeutic options for recurrent cervical cancer, the primary initial therapy and the site of recurrence must be taken into account. If the initial treatment was surgery without postoperative RT for initial cervical cancer, the treatment-of-choice is usually RT with concurrent chemotherapy, and the response rates range from 45% to 75% (11-15). Few studies reported the outcome of radical hysterectomy, which avoids exenteration, as a salvage treatment for minimal residual disease or small recurrence (16, 17). However, pelvic exenteration is considered the

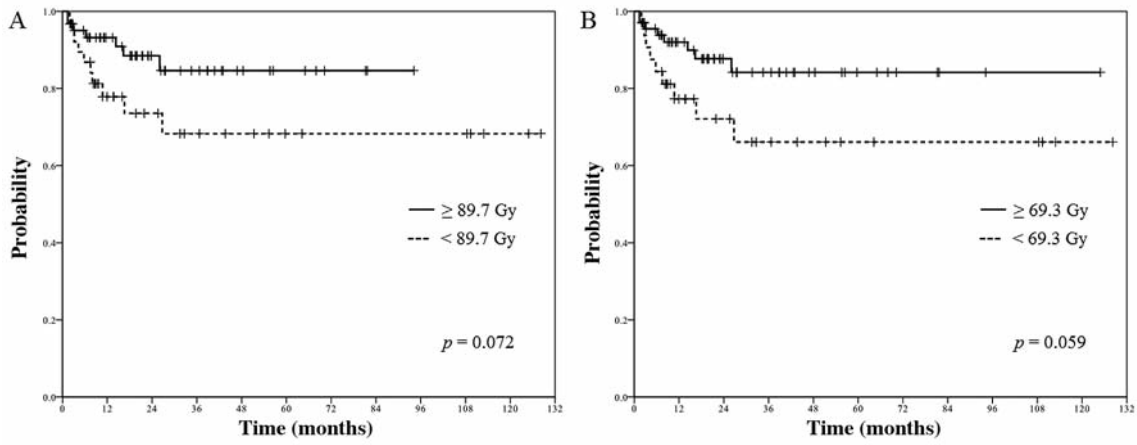

Figure 1. *Local progression-free survival according to BED. A: Patients treated with ≥89.7 Gy vs. those treated with <89.7 Gy. B: Patients treated with ≥ 69.3 Gy vs. those treated with <69.3 Gy.*

optimal form of surgery for central recurrence of cervical cancer after primary or adjuvant RT, and a 5-year survival rate of approximately 20-40% was reported (18-21). This procedure can remove the tumor and invaded bladder/rectum, but it is accompanied by a high rate of morbidity arising from denuded pelvic wall and floor at the same time (22, 23). Laterally extended endopelvic resection can be applied for the treatment of recurrences affecting the pelvic wall, but this procedure is also highly morbid. Hockel *et al*. reported a 5-year disease-specific OS rate of 55% with two procedure-related deaths (2%) and a 70% morbidity rate (24).

We employed SBRT rather than conventional chemo-RT or surgical intervention as salvage treatment for recurrent or metastatic cervical cancer. The present study demonstrated excellent local control and favorable survival outcome. Local progression at SBRT sites occurred in 17 out of 100 treated lesions (crude local failure rate, 17%), and the actuarial 2-year and 5-year LPFS rates were 82.5% and 78.8%, respectively. The median OS time after completion of SBRT for recurrent or metastatic lesions was 32.7 months, and the actuarial 2-year and 5-year OS rates were 57.5% and 32.9%, respectively. These treatment outcomes were comparable to the outcomes of previously mentioned studies with other modalities, considering that our study population included cases with distant metastases. More importantly, these results were achieved with remarkably low morbidity. There were only five cases (5%) of grade 3 and 4 chronic toxicities.

There have been many studies in which selected cases of distant metastases, so called oligometastases, were successfully salvaged, and sometimes gained long-term survival, as well in various types of cancer (25-28). Oligometastases is the state of disease before tumor cells acquire widespread metastatic potential (26, 28) and, therefore, can be cured with proper local treatment, such as surgical resection or SBRT. For lung metastases from cervical cancer, as the sole metastatic site and numbering not more than three, metastasectomy followed by chemotherapy achieved a 5-year survival rate of 46% (29). For isolated para-aortic LN metastases from cancer of the uterine cervix and corpus, SBRT achieved local control in 67.4% with an OS rate at 4-year of 50% (30). Our analysis revealed that the presence of more than one recurrence did not result in inferior local control or a short survival period. This suggests that oligometastases from cervical cancer should initially be treated with curative, not palliative aim.

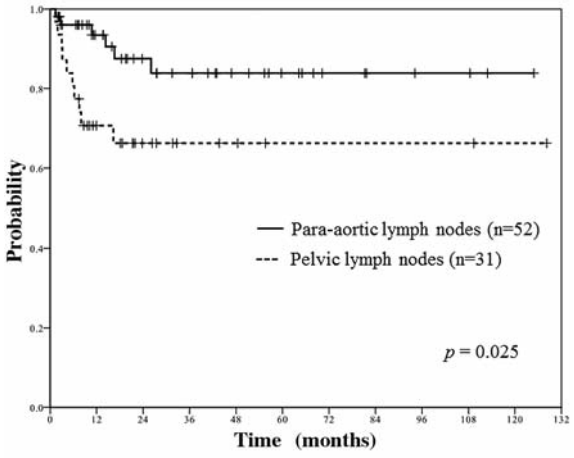

Figure 2. *Local progression-free survival comparing patients with para-aortic lymph node metastases vs. those with pelvic lymph node metastases.*

There exist limited data exploring the feasibility of SBRT in locoregional relapse of cervical cancer. Deodato *et al*. reported the outcomes of SBRT in recurrent gynecological

Table IV. *Details of chronic toxicities.*

Toxicity grade	Toxicity	SBRT site	Initial treatment for cervix cancer	Time to toxicity (months)	Dose-fractionation	Local progression (months)
4	Recto-vaginal fistula	Rt IIN	TAH+WPRT, 50.4 Gy	5.7	38 Gy/3 fractions	O
4	Recto-vaginal fistula	Rt IIN	RH+WPRT, 50.4 Gy	6.3	36 Gy/3 fractions	X
3	Urethral stricture	Lt PAN-CIN	RH+WPRT,50.4 Gy	20.7	36 Gy/3 fractions	X
3	Ileus	Lt PAN	Radical CCRT+ICR	3.7	36 Gy/3 fractions	X
3	Enterocolitis	Lt CIN	Radical CCRT+ICR	2.7	32 Gy/5 fractions	X

SBRT, Stereotactic body radiotherapy; Lt, left; Rt, right; TAH, total abdominal hysterectomy; RH, radical hysterectomy; WPRT, whole-pelvis radiotherapy; PAN, para-aortic lymph node; CIN, common iliac lymph node; IIN, internal iliac lymph node; X, no; O, yes.

cancer (8). Eleven patients (12 lesions; four ovarian, four cervical and three uterine cancer) were treated with a dose of 20-30 Gy in 4-6 fractions, and six cases were of re-irradiation. With a median follow-up of 19 months, seven patients (63%) showed local or distant progression of disease. The 2-year LPFS was 81.8%, and the 2-year OS was 63.6%. Acute and late toxicities were grade 2 or less. Kunos *et al*. reported a case series of SBRT for pelvic relapse of gynecological cancer (7). Five patients (three ovarian, one cervical, and one uterine cancer) were treated with a dose of 15-24 Gy in three fractions, and all of them were for re-irradiation. Only one patient developed disease relapse within the pelvis. Although these two studies show the possible efficacy of SBRT as a therapeutic option and safety of SBRT application in recurrent cervical cancer within the pelvis, these studies were too small and, moreover, heterogeneous primary cancer types were included.

There is a study that included the same group of patients as our study, but applied different types of RT modalities. Liu *et al*. evaluated the outcomes of irradiation using 3-dimensional RT (3D-RT) or intensity-modulated RT (IMRT) for recurrent and metastatic cervical cancer (31). Among 50 patients, 16 underwent 3D-RT and 34 received IMRT, and they were treated with a median dose of 50 Gy. With a median follow-up of 18.3 months, 3-year locoregional control and OS rates were 59.7% and 56.1%, respectively. Two patients developed grade 3 late toxicities. The OS rate was comparable with that of our study in that 2-year and 5-year OS rates were 57.5% and 32.9%, respectively. However, local control was somewhat lower compared to ours. This is a reasonable result because the dose delivered with SBRT in our study (median BED, 89.7 Gy) was far more than the dose in Liu *et al*.'s study.

We tried to deliver more than 39 Gy in three fractions to the targeted volume. However, dose-fractionation modification was sometimes inevitable due to the dose constraint of surrounding normal organs such as the bowel, bladder, and spinal cord, especially in cases of re-irradiation. According to univariate analysis, a higher BED tended to predict superior local control. Although our result had only marginal significance, it seems reasonable that a higher dose can increase the possibility of tumor ablation. In the present study, 14 distant metastases were treated with relatively higher doses of radiation comparing to para-aortic and pelvic LNs (liver 45-51 Gy, lung 39 Gy, mediastinal LN 39-42 Gy, supraclavicular LN 36-42 Gy, abdominal wall 39 Gy, iliac bone 38 Gy all in three fractions) and resulted in only one local failure. Our study is concordant with the idea that there is monotonic relationship between tumor control probability and BED for SBRT (32).

It is important to state the weakness of our data. When we initially planned this analysis, we expected that it would be possible to compare local control between different treated sites. Therefore, we expected to find an optimal dose to ablate metastases for each organ. However, the number of metastatic lesions other than pelvic LNs and para-aortic LNs was small, and this was attributed to the nature of cervical cancer, with a low incidence of distant metastases.

Our study has its own valuable aspects despite this limitation. Firstly, three institutions participating in this study had almost the same treatment equipment (CyberKnife) and protocol with regard to target delineation and dose fractionation. This guaranteed homogeneity of SBRT even though this was multi-institutional study. Secondly, our SBRT dose (median BED, 89.7 Gy) was much higher than that of previously mentioned studies (7, 8). This means that the SBRT technique of each institution was sophisticated enough to deliver a high ablative dose to the tumor while sparing surrounding normal organs. Finally, to the best of your knowledge, this is the largest study to apply SBRT for recurrent or metastatic uterine cervical cancer. Again, the exclusive enrollment of patients with cervical cancer guarantees homogeneity in terms of the study population. Although further validation through a larger patient cohort and, preferably, by a prospective trial is needed, our results would suggest SBRT as a treatment option to control recurrent or metastatic uterine cervical cancer.

In conclusion, SBRT for recurrent or metastatic uterine cervical cancer resulted in excellent local control and this

tended to be more evident in the group of patients with a long disease-free interval (more than 36 months) and treatment with a high BED. This promising local control was achieved with acceptable toxicities, regardless of previous irradiation history. Therefore, SBRT can be considered as a primary therapeutic option for recurrent or oligometastatic cervical cancer.

Acknowledgements

This work was supported by the Soonchunhyang University Research Fund.

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Received May 8, 2015
Revised June 8, 2015
Accepted June 10, 2015